

The storm was of a very erratic nature. It originated as a depression over northern Tonga several days prior to the 20th, crossed the Fiji Islands as still a weak low, backed later toward the Tongas, then returned to Fiji, intensifying with great rapidity. The high winds began from the south in the morning, and reached their greatest force from the north in the afternoon. The calm center crossed Levuka, beginning at about 11:45 a. m. and continuing for nearly an hour. During this period the sun shone for a few minutes. The lowest barometer, read as the light central winds were giving place to heavy northerly gales, was 28.37 inches (960.7 millibars). At Suva the maximum velocity was 110 miles. The rainfall at Suva amounted to 6.49 inches for the 24-hour period 8 a. m. of the 20th to 8 a. m. of the 21st.

Considerable damage was done in various parts of the islands to houses, fruit trees, and crops. Several small vessels were stranded on the reefs and beaches, and some were destroyed. A few lives were reported lost.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

The precipitation pattern for March coincided very closely with that for February. As in February, precipitation was well above normal in the States from Texas westward to the ocean. All of the States in the northern, central, and eastern parts of the country were below normal except for South Carolina and Florida which were above normal. The central Mississippi and Ohio Valleys again were the driest sections of the country. River stages were unusually low in these sections. The Mississippi River at Vicksburg, Miss., had lower stages than previously recorded in March since 1895.

High water and light to moderate flooding continued in much of eastern Texas, in Arizona, and in California. These floods and others that occurred during the month are given below.

Atlantic Slope drainage.—The weather remained cold during most of the month with only short periods of high temperature. The snow cover in the Northeast was reduced somewhat with only moderate rises in the streams. At the end of the month the average snow depth over the Connecticut Basin was 9.6 inches with a water content of 3.1 inches; in the Susquehanna Basin above Towanda, Pa., the snow depth averaged 3.5 inches and below Towanda, only a trace.

Slight flooding occurred in the Neuse and Savannah Rivers during the month. In the Neuse River, flood stage was exceeded at Smithfield, N. C., on March 30. The Savannah River experienced two rises to slightly above flood stage at Clio, Ga., and Ellenton, S. C. No damage was reported.

East Gulf of Mexico drainage.—Heavy rains on March 6–7, averaging about 3 inches over the Black Warrior and Tombigbee Rivers and 2.5 inches over the Pearl and Pascagoula Rivers, resulted in substantial rises in these rivers. Minor flooding occurred in the Tombigbee River below Demopolis, Ala., and at a few points in the Pearl and Pascagoula Rivers. The damage in the Tombigbee is estimated at \$2,000, and in the Pearl and Pascagoula at \$13,000.

Upper Mississippi Basin.—Flooding occurred in the Zumbro-Whitewater Rivers in Minnesota and in the Rock River in Illinois during the latter part of the month. No damage was reported except for a loss amounting to \$2,500 in the Zumbro-Whitewater Basin.

Missouri Basin.—Ice broke up in the Heart River which drains into the Missouri River just below Bismarck, N. Dak., on March 26. During the night the Heart River rose considerably, the water being backed up by the solid ice in the Missouri. Some bottom lands were flooded but no damage resulted.

Flood stages were reached and exceeded in the Big Sioux and Floyd Rivers. Because of the earliness of the season there was no appreciable damage.

The following report was submitted by the official in charge, Helena, Mont.:

An earlier-than-usual spring run-off of water from melted snow and ice in the upper drainage basin of the west and north forks of the Milk River was dammed by ice jams until March 21, when a breakup began. The water was released and overflowed the banks and inundated a large tract of land near the mouth of the streams in the vicinity of Chinook, Blaine County. Flood waters continued on the 22d, cresting on the 23d. When the flood waters reached the Milk River on the 23d, ice jams formed in that stream and caused flooding.

Most of the damage resulting from the flood occurred in the vicinity of Chinook, with lesser damage occurring near Harlem. The aggregate damage has been estimated at \$10,000.

Red Basin.—Heavy rains in the watershed of the Ouachita and Little Missouri Rivers on March 6–7 caused flood stages in the Ouachita at Camden, Ark., from March 9–14 with only slight damage resulting.

River stages continued high in the Sulphur River from rains occurring at the end of February and again on March 6–7. The river crested at Ringo Crossing, Tex., on March 8 at a stage of 28.5 feet and at Naples, Tex., on March 11 at 27.6 feet. Losses were reported in the previous report.

West Gulf of Mexico drainage.—Rains were again above normal in eastern Texas during March and river stages continued high. Minor flooding occurred but with no appreciable damage.

Colorado River Basin.—Heavy rains, principally over the Verde River watershed, caused a rise in that river and in the Salt River into which it flows, the Salt River cresting at a stage of 7.4 feet at Phoenix, Ariz., on March 15. The flood was of a minor nature but was of much interest due to the fact that there had been no flow in the Salt River since the recent construction of Bartlett Dam on the Verde River which had contributed to the flood problem in Phoenix prior to the construction of that dam.

As a result of warnings issued no losses were experienced and it is estimated that the savings as the result of the warnings approximated \$5,000.

Rains were heavy in central Arizona during the middle of March resulting in a local flood in Pinal Creek and considerable damage to highways. Two lives were lost in connection with a sudden rise in Clear Creek, a tributary of the Little Colorado River near Winslow, Ariz.

Pacific Slope drainage.—Stream discharges were high in most of California during the month. A surplus of water moved into the Tulare Lake Basin and additional farm lands were inundated. A mild flood occurred in the lower Eel River on March 1–2.

Another flood in the long series that marked the 1940–41 season began in the Sacramento Valley on the last day of February. The official in charge, Sacramento, Calif., reports as follows:

Following the high water that occurred in this valley during the second week in February, frequent rains kept the water levels moderately high until near the end of the month, when flood conditions again developed in the upper Sacramento River.

During the closing days of February an unusually extensive system of low pressure which was charted off the Pacific coast caused

general rains over northern California, with heavy amounts beginning in Shasta County on the 27th. On the morning of the 28th, an intensive secondary cyclonic center was located about 150 miles southwest of the San Francisco Bay, and during its slow advance northward that day, winds of gale force occurred in the open valleys. At the Sacramento Municipal Airport a current velocity of 52 miles an hour was registered, while at the city office 41 miles represented the extreme velocity.

The high winds caused some damage to power and telephone lines, trees, farm buildings, etc., locally in the San Joaquin and Sacramento Valleys.

The upper Sacramento River began to rise rapidly on the morning of the 28th, and flood warnings were issued during the day for the river from Red Bluff to the mouth of Stony Creek. On March 1 the crest stage at Red Bluff was 25.6 feet, or 2.6 feet above the flood stage and 0.9 foot above that which occurred in the early part of February this year.

Stony Creek was especially high, as indicated by the unusually high stage of 12.4 feet at St. John. This represents the highest water there since the record high of 13.9 feet which occurred just 1 year ago. This creek was responsible for the washing out of the east approach of the bridge over Stony Creek on the Orland-Chico highway.

Despite the fact that both the Sacramento River at Red Bluff and Stony Creek at St. John carried more water than they did during the flood of the forepart of February, the resultant maximum gage heights at Hamilton City and Colusa were slightly lower than in the first February freshet this year. This is mainly true, it is believed, because the east-side creeks, such as Deer, Mill, and Antelope, were not discharging so heavily.

On March 2 it was reported that a 50-foot break occurred in the east-side levee at Goodman Ranch, about 5 miles north of Butte City, allowing water from the Sacramento River to escape more rapidly into the already heavily flooded Butte Basin.

During the peak of the flood Butte City was isolated because of the flooding of the highways in that vicinity. The town of Tehama also suffered a similar experience. Many highways throughout the valley were temporarily closed either by overflow water or the accumulation of local drainage in low places.

The State Highway Department reported that cloudburst conditions in mountain areas caused heavy damage locally by washing out highway embankments. The principal areas affected were the Feather River Canyon, the Sacramento River Canyon, and the highway along Willow Creek, in Shasta County, on the road from Reading to Weaverville. Other damage was done in places by mountain streams.

Excessive run-off during the present flood period occurred only in the upper Sacramento drainage area. The American and Feather Rivers, as was the case in previous floods this season, were not exceptionally high.

However, on March 3, the slowly rising river at Sacramento occasioned the closing of the flood-control gages on Highway 40 at North Sacramento. The Sacramento River reading at that time was 26.2 feet, but about 1 foot of water had been held back along the low section of the highway by the use of sand bags.

The lower San Joaquin River reached its peak on March 6 with a stage of 15.5 feet at Lathrop, or 1.5 feet below the flood stage there. In the vicinity of Durham Ferry bridge, mostly on the River Junction Farms, there was considerable flooding of lowland, caused by old levee breaks (those of previous years) which had not been repaired. The actual losses sustained in this area were not heavy because the water was not high enough to affect farm houses and also because crop planting, in general, had purposely been delayed.

The flooded lowlands throughout the valleys represented approximately the same areas that were previously flooded this season, including the island tracts of Little Holland, Liberty, and Prospect in the Yolo bypass. As the earlier flood waters had only partially receded, the actual additional damage to inundated lands was comparatively light, although the resultant loss due to the continuously water-covered areas, thus delaying and preventing the planting of seasonal crops, was considerable and difficult to evaluate. Also the sustained high water on the levees resulted in seepage conditions that killed fruit trees in many lowland orchards adjacent to the river.

The total losses have been estimated at about \$600,000.

TABLE OF FLOOD LOSSES AND SAVINGS DURING
MARCH 1941

River and drainage	Tangible property	Matured crops	Prospective crops	Live-stock and other movable farm property	Suspension of business	Total losses	Savings as result of flood warnings
EAST GULF OF MEXICO DRAINAGE							
Tombigbee River.....	\$1,000				\$1,000	\$2,000	\$2,500
Pascagoula River.....					10,000	10,000	6,000
Pearl River.....					3,000	3,000	1,500
MISSISSIPPI SYSTEM							
<i>Upper Mississippi Basin</i>							
Zumbro-Whitewater Rivers.....	2,215		\$285			2,500	
<i>Missouri Basin</i>							
Milk River in Montana.....						10,000	
<i>Red Basin</i>							
Ouachita River.....				\$500	1,000	1,500	5,500
WEST GULF OF MEXICO DRAINAGE							
Guadalupe River.....							1,200
GULF OF CALIFORNIA DRAINAGE							
Salt River ¹							5,000
PACIFIC SLOPE DRAINAGE							
San Joaquin River.....	8,000	\$2,130	20,000			30,130	
Sacramento River.....	450,000	40,000	70,000		5,000	565,000	5,000

¹ Figures on losses not available.

FLOOD-STAGE REPORT FOR MARCH 1941

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Neuse: Smithfield, N. C.....	13	29	(1)	13.8	30
Savannah: Clio, Ga.....	11	16	18	11.2	17
EAST GULF OF MEXICO DRAINAGE					
Tombigbee:					
Lock No. 4, Demopolis, Ala.....	39	9	14	44.2	12
Lock No. 3, Whitfield, Ala.....	33	7	17	46.4	12
Lock No. 2, Pennington, Ala.....	46	9	15	48.0	13
Lock No. 1, Salitpa, Ala.....	31	9	18	33.4	14-15
Chickasawhay: Shubuta, Miss.....	26	8	9	27.0	9
Pascagoula: Merrill, Miss.....	22	11	13	22.4	12
Pearl:					
Jackson, Miss.....	13	{ 8	19	22.4	15
Pearl River, La.....	12	{ 21	24	19.8	22
		11	18	13.6	14
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Rock: Moline, Ill.....	10	22	27	10.6	24
Missouri Basin					
Floyd: James, Ia.....	14			16.6	6
Big Sioux: Akron, Ia.....	12	{		13.2	13
				13.2	25
Red Basin					
Ouachita: Camden, Ark.....	26	8	15	29.5	11
Sulphur:					
Ringo Crossing, Tex.....	20	{ (2)	1		
Naples, Tex.....	22	6	10	28.5	8
		2	17	27.6	11
WEST GULF OF MEXICO DRAINAGE					
Sabine: Logansport, La.....	25	11	14	25.8	13
Trinity:					
Trinidad, Tex.....	28	(2)	13	32.2	10
Long Lake, Tex.....	40	1	4	40.9	3
		12	16	41.0	14
Liberty, Tex.....	24	(2)	2	24.3	1
		7	26	26.2	13
Guadalupe: Victoria, Tex.....	21	{ 19	20	22.2	19
		20	23	25.9	22
PACIFIC SLOPE DRAINAGE					
Sacramento Basin					
Stony Creek: St. John, Calif.....	12	1	1	12.4	1
Sacramento:					
Red Bluff, Calif.....	23	(2)	2	25.55	1
Hamilton City, Calif.....	20	1	1	20.1	1
Knights Landing, Calif.....	30	1	8	31.7	4
Eel Basin					
Eel: Fernbridge, Calif.....	17.5	1	2	19.05	

¹ Continued into next month.

² Continued from preceding month.